Low-power configurable multiple function gate Rev. 8 — 7 December 2016 P

Product data sheet

#### **General description** 1.

The 74LVC1G57 provides configurable multiple functions. The output state is determined by eight patterns of 3-bit input. The user can choose the logic functions AND, OR, NAND, NOR, XNOR, inverter and buffer. All inputs can be connected to  $V_{CC}$  or GND.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

This device is fully specified for partial power-down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

All inputs (A, B and C) are Schmitt trigger inputs. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

#### 2. **Features and benefits**

- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant input/output for interfacing with 5 V logic
- High noise immunity
- Complies with JEDEC standard:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8B/JESD36 (2.7 V to 3.6 V).
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- ±24 mA output drive (V<sub>CC</sub> = 3.0 V)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- Multiple package options
- Specified from –40 °C to +85 °C and –40 °C to +125 °C.

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### Low-power configurable multiple function gate

## 3. Ordering information

Type number	Package							
	Temperature range	Name	Description	Version				
74LVC1G57GW	–40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363				
74LVC1G57GV	–40 °C to +125 °C	SC-74	plastic surface-mounted package; 6 leads	SOT457				
74LVC1G57GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body $1 \times 1.45 \times 0.5$ mm	SOT886				
74LVC1G57GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body $1 \times 1 \times 0.5$ mm	SOT891				
74LVC1G57GN	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $0.9 \times 1.0 \times 0.35$ mm	SOT1115				
74LVC1G57GS	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $1.0 \times 1.0 \times 0.35$ mm	SOT1202				

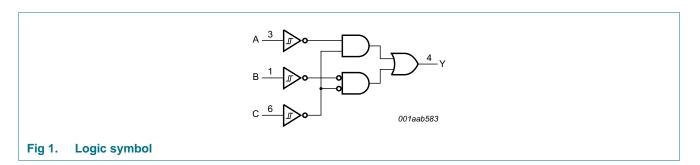
### 4. Marking

#### Table 2. Marking

Type number	Marking code <sup>[1]</sup>
74LVC1G57GW	YC
74LVC1G57GV	V57
74LVC1G57GM	YC
74LVC1G57GF	YC
74LVC1G57GN	YC
74LVC1G57GS	YC

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

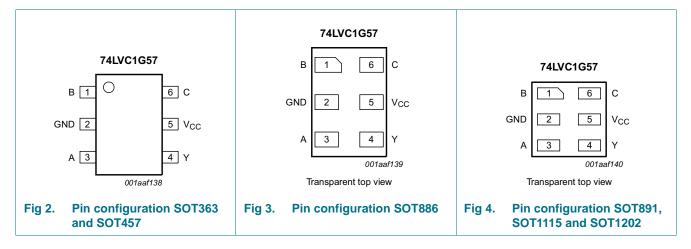
## 5. Functional diagram



Low-power configurable multiple function gate

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3.         Pin description		
Symbol	Pin	Description
В	1	data input
GND	2	ground (0 V)
A	3	data input
Y	4	data output
Vcc	5	supply voltage
С	6	data input

## 7. Functional description

### Table 4.Function table

Input			Output
C	В	Α	Y
L	L	L	Н
L	L	Н	L
L	Н	L	Н
L	Н	Н	L
Н	L	L	L
Н	L	Н	L
Н	Н	L	Н
Н	Н	Н	Н

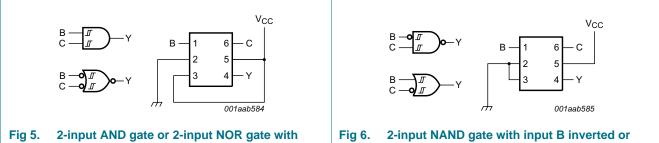
[1] H = HIGH voltage level; L = LOW voltage level.

Low-power configurable multiple function gate

### 7.1 Logic configurations

#### **Function selection table** Table 5.

Logic function	Figure
2-input AND	see <u>Figure 5</u>
2-input AND with both inputs inverted	see Figure 8
2-input NAND with inverted input	see Figure 6 and Figure 7
2-input OR with inverted input	see <u>Figure 6</u> and <u>Figure 7</u>
2-input NOR	see Figure 8
2-input NOR with both inputs inverted	see <u>Figure 5</u>
2-input XNOR	see Figure 9
Inverter	see Figure 10
Buffer	see Figure 11



both inputs inverted

2-input OR gate with inverted C input

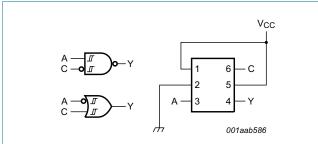


Fig 7. 2-input NAND gate with input C inverted or 2-input OR gate with inverted A input

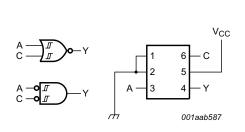
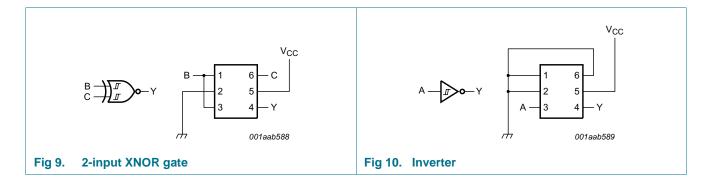
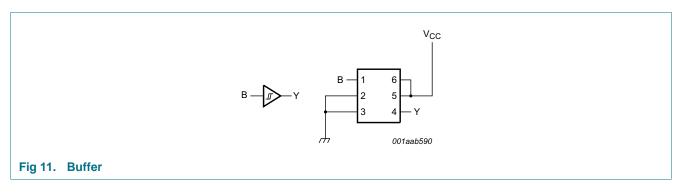


Fig 8. 2-input NOR gate or 2-input AND gate with both inputs inverted



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#### Low-power configurable multiple function gate



## 8. Limiting values

#### Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>CC</sub>	supply voltage			-0.5	+6.5	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V		-50	-	mA
VI	input voltage		<u>[1]</u>	-0.5	+6.5	V
I <sub>OK</sub>	output clamping current	$V_{\rm O}$ > $V_{\rm CC}$ or $V_{\rm O}$ < 0 V		-	±50	mA
Vo	output voltage	Active mode	[1][2]	-0.5	+6.5	V
		Power-down mode	[1][2]	-0.5	+6.5	V
I <sub>O</sub>	output current	$V_{O} = 0 V \text{ to } V_{CC}$		-	±50	mA
I <sub>CC</sub>	supply current			-	+100	mA
I <sub>GND</sub>	ground current			-100	-	mA
T <sub>stg</sub>	storage temperature			-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40 \ ^{\circ}C \ to \ +125 \ ^{\circ}C$	<u>[3]</u>	-	250	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] When  $V_{CC} = 0 V$  (Power-down mode), the output voltage can be 5.5 V in normal operation.

[3] For SC-88 and SC-74 packages: above 87.5 °C the value of  $P_{tot}$  derates linearly with 4.0 mW/K. For XSON6 packages: above 118 °C the value of  $P_{tot}$  derates linearly with 7.8 mW/K.

## 9. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V <sub>CC</sub>	supply voltage		1.65	-	5.5	V
VI	input voltage		0	-	5.5	V
Vo	output voltage	Active mode	0	-	V <sub>CC</sub>	V
		V <sub>CC</sub> = 0 V; Power-down mode	0	-	5.5	V
T <sub>amb</sub>	ambient temperature		-40	-	+125	°C

#### Low-power configurable multiple function gate

## **10. Static characteristics**

#### Table 8. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40	°C to +85	°C	–40 °C to	–40 °C to +125 °C		
			Min	Typ <mark>[1]</mark>	Max	Min	Max		
V <sub>OL</sub>	LOW-level	$V_I = V_{T+}$ or $V_{T-}$							
	output voltage	$I_{O}$ = 100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V	-	-	0.1	-	0.1	V	
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.45	-	0.7	V	
		$I_0 = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.3	-	0.45	V	
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	-	0.6	V	
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.55	-	0.8	V	
		I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V	-	-	0.55	-	0.8	V	
V <sub>ОН</sub>	HIGH-level output voltage	$V_{I} = V_{T+} \text{ or } V_{T-}$							
		$I_{O} = -100 \ \mu A;$ $V_{CC} = 1.65 \ V \ to \ 5.5 \ V$	$V_{CC}-0.1$	-	-	V <sub>CC</sub> - 0.1	-	V	
		$I_{O} = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	1.2	-	-	0.95	-	V	
		$I_0 = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.9	-	-	1.7	-	V	
		$I_0 = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	1.9	-	V	
		$I_0 = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.3	-	-	2.0	-	V	
		$I_{O} = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.8	-	-	3.4	-	V	
I	input leakage current	$V_I = 5.5 V \text{ or GND};$ $V_{CC} = 0 V \text{ to } 5.5 V$	-	±0.1	±1	-	±1	μΑ	
I <sub>OFF</sub>	power-off leakage current	$V_{I} \text{ or } V_{O} = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	±0.1	±2	-	±2	μΑ	
I <sub>CC</sub>	supply current	$V_{I} = 5.5 V \text{ or GND}; I_{O} = 0 \text{ A};$ $V_{CC} = 1.65 V \text{ to } 5.5 V$	-	0.1	4	-	4	μA	
∆l <sub>CC</sub>	additional supply current		-	5	500	-	500	μA	
CI	input capacitance		-	2.5	-	-	-	pF	

[1] Typical values are measured at maximum V<sub>CC</sub> and T<sub>amb</sub> = 25 °C.

#### Low-power configurable multiple function gate

## **11. Dynamic characteristics**

#### Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 13.

Symbol	Parameter	Conditions	–40 °C to +85 °C		–40 °C to +125 °C		Unit	
			Min	Typ <mark>[1]</mark>	Max	Min	Max	
t <sub>pd</sub>	propagation delay	A, B, C to Y; see <u>Figure 12</u> [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	6.0	14.4	1.0	18	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	0.5	3.5	8.3	0.5	10.4	ns
		V <sub>CC</sub> = 2.7 V	0.5	4.2	8.5	0.5	10.6	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	3.8	6.3	0.5	7.9	ns
		$V_{CC} = 4.5 V \text{ to } 5.5 V$	0.5	3.0	5.1	0.5	6.4	ns
C <sub>PD</sub>	power dissipation capacitance	$V_{CC} = 3.3 \text{ V}; \text{ V}_{I} = \text{GND to V}_{CC}$ [3]	-	22	-	-	-	pF

[1] Typical values are measured at nominal V<sub>CC</sub> and at  $T_{amb}$  = 25 °C.

[2]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ 

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

 $\mathsf{P}_{\mathsf{D}} = \mathsf{C}_{\mathsf{P}\mathsf{D}} \times \mathsf{V}_{\mathsf{C}\mathsf{C}}^2 \times \mathsf{f}_i \times \mathsf{N} + \Sigma(\mathsf{C}_{\mathsf{L}} \times \mathsf{V}_{\mathsf{C}\mathsf{C}}^2 \times \mathsf{f}_o) \text{ where:}$ 

 $f_i$  = input frequency in MHz;

 $f_o = output frequency in MHz;$ 

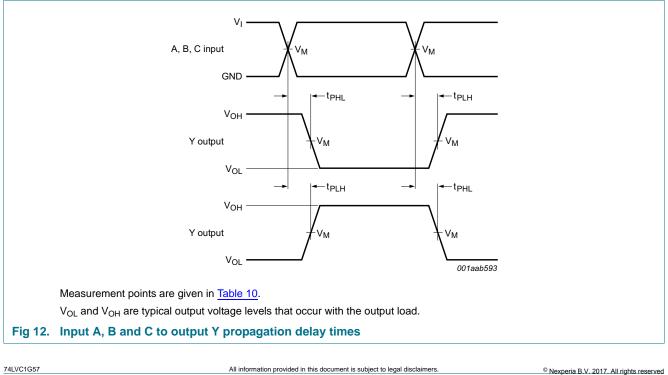
 $C_L$  = output load capacitance in pF;

 $V_{CC}$  = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

## 12. Waveforms



Product data sheet

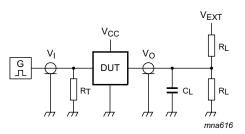
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### Low-power configurable multiple function gate

Input		Output			
V <sub>M</sub>	VI	V <sub>M</sub>			
0.5V <sub>CC</sub>	V <sub>CC</sub>	0.5V <sub>CC</sub>			
0.5V <sub>CC</sub>	V <sub>CC</sub>	0.5V <sub>CC</sub>			
1.5 V	2.7 V	1.5 V			
1.5 V	2.7 V	1.5 V			
0.5V <sub>CC</sub>	V <sub>CC</sub>	0.5V <sub>CC</sub>			
	Input           V <sub>M</sub> 0.5V <sub>CC</sub> 0.5V <sub>CC</sub> 1.5 ∨           1.5 ∨	Input           V <sub>M</sub> VI           0.5V <sub>CC</sub> V <sub>CC</sub> 0.5V <sub>CC</sub> V <sub>CC</sub> 1.5 V         2.7 V           1.5 V         2.7 V	Input         Output $V_M$ $V_I$ $V_M$ $0.5V_{CC}$ $V_{CC}$ $0.5V_{CC}$ $0.5V_{CC}$ $V_{CC}$ $0.5V_{CC}$ $1.5 V$ $2.7 V$ $1.5 V$ $1.5 V$ $2.7 V$ $1.5 V$		

#### Table 10. Measurement points



Measurement points are given in <u>Table 11</u>.

Definitions test circuit:

R<sub>L</sub> = Load resistance.

 $C_L$  = Load capacitance including jig and probe capacitance.

 $R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.

V<sub>EXT</sub> = External voltage for measuring switching times.

#### Fig 13. Test circuit for measuring switching times

#### Table 11. Measurement points

Supply voltage	Input	Input			V <sub>EXT</sub>	
V <sub>cc</sub>	VI	$t_r = t_f$	C∟	RL	t <sub>PLH</sub> , t <sub>PHL</sub>	
1.65 V to 1.95 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	1 kΩ	open	
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	500 Ω	open	
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	
4.5 V to 5.5 V	V <sub>CC</sub>	$\leq$ 2.5 ns	50 pF	500 Ω	open	

### Low-power configurable multiple function gate

## **13. Transfer characteristics**

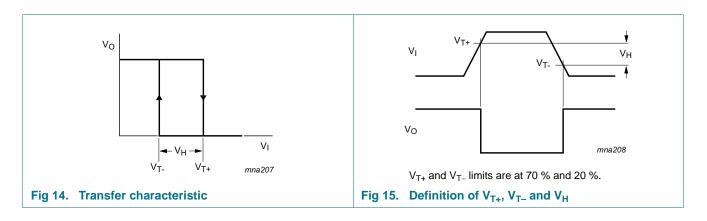
#### Table 12. Transfer characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40	) °C to +85	5 °C	–40 °C to	Unit	
			Min	Typ <mark>[1]</mark>	Max	Min	Max	
V <sub>T+</sub>	positive-going threshold voltage	see <u>Figure 14</u> , <u>Figure 15</u> , <u>Figure 16</u> and <u>Figure 17</u>						
		V <sub>CC</sub> = 1.8 V	0.70	1.02	1.20	0.67	1.20	V
		V <sub>CC</sub> = 2.3 V	1.11	1.42	1.60	1.08	1.60	V
		V <sub>CC</sub> = 3.0 V	1.50	1.79	2.00	1.47	2.00	V
		V <sub>CC</sub> = 4.5 V	2.16	2.52	2.74	2.13	2.74	V
		V <sub>CC</sub> = 5.5 V	2.61	2.99	3.33	2.58	3.33	V
	negative-going threshold voltage	see <u>Figure 14</u> , <u>Figure 15</u> , <u>Figure 16</u> and <u>Figure 17</u>						
		V <sub>CC</sub> = 1.8 V	0.30	0.53	0.72	0.30	0.75	V
		V <sub>CC</sub> = 2.3 V	0.58	0.77	1.00	0.58	1.03	V
		V <sub>CC</sub> = 3.0 V	0.80	1.04	1.30	0.80	1.33	V
		V <sub>CC</sub> = 4.5 V	1.21	1.55	1.90	1.21	1.93	V
		V <sub>CC</sub> = 5.5 V	1.45	1.86	2.29	1.45	2.32	V
V <sub>H</sub> hysteresis voltage		$(V_{T+} - V_{T-});$ see <u>Figure 14</u> , <u>Figure 15</u> , Figure 16 and Figure 17						
		V <sub>CC</sub> = 1.8 V	0.30	0.48	0.62	0.23	0.62	V
		V <sub>CC</sub> = 2.3 V	0.40	0.64	0.80	0.34	0.80	V
		V <sub>CC</sub> = 3.0 V	0.50	0.75	1.00	0.44	1.00	V
		V <sub>CC</sub> = 4.5 V	0.71	0.97	1.20	0.65	1.20	V
		V <sub>CC</sub> = 5.5 V	0.71	1.13	1.40	0.65	1.40	V

[1] Typical values are measured at  $T_{amb}$  = 25 °C.

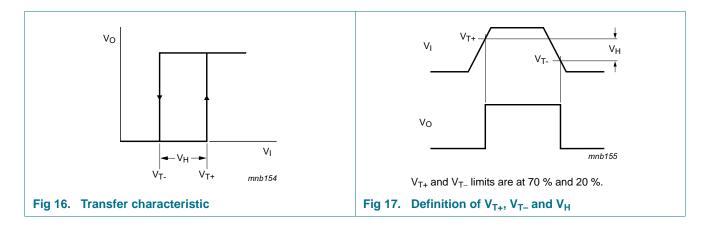
### 14. Waveforms transfer characteristics

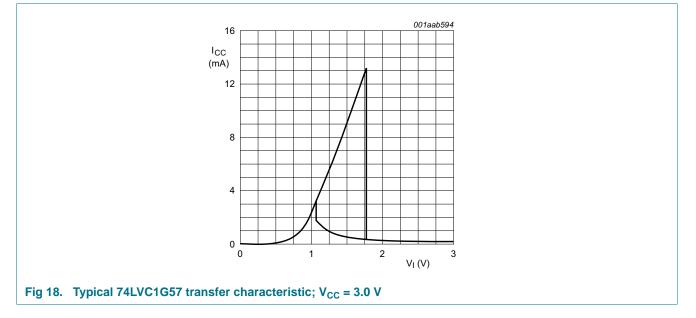


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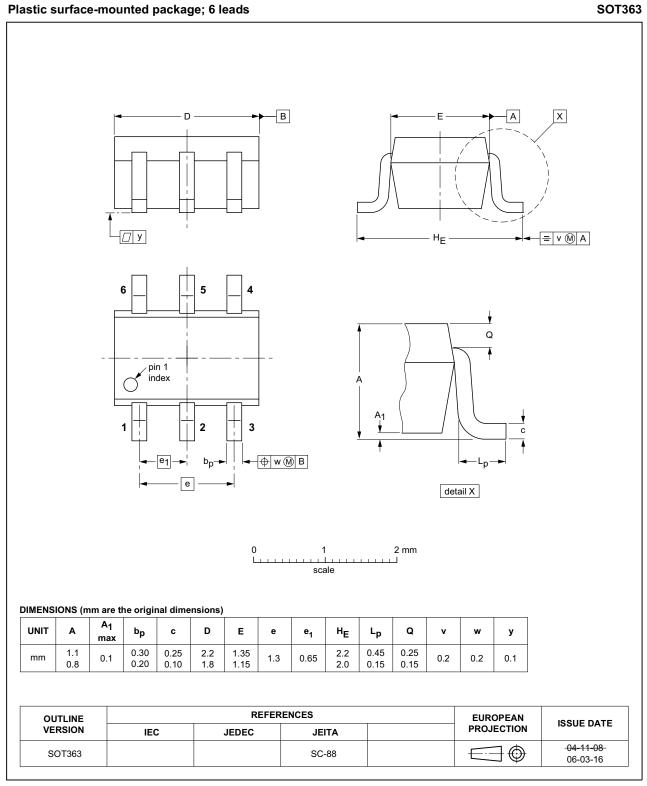
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## 15. Package outline



#### Fig 19. Package outline SOT363 (SC-88)

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**Product data sheet** 

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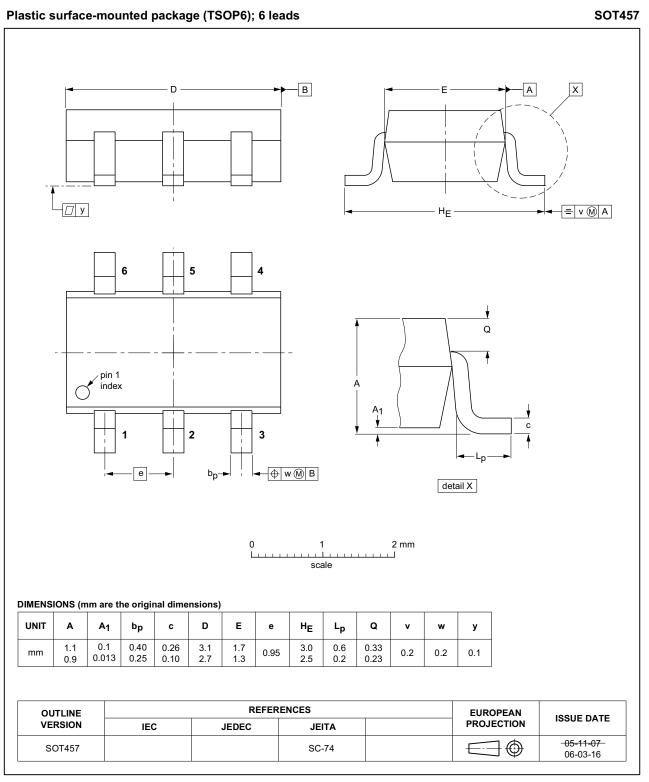


Fig 20. Package outline SOT457 (SC-74)

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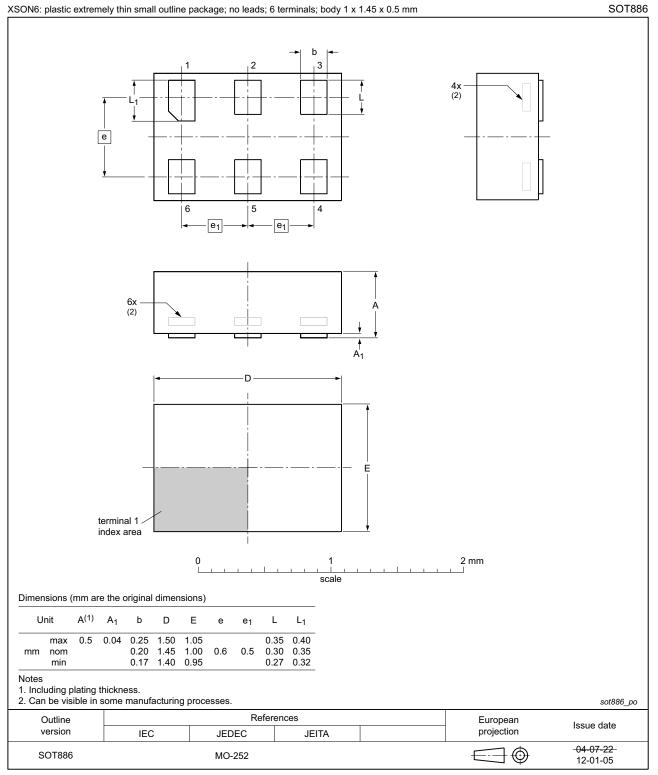


Fig 21. Package outline SOT886 (XSON6)

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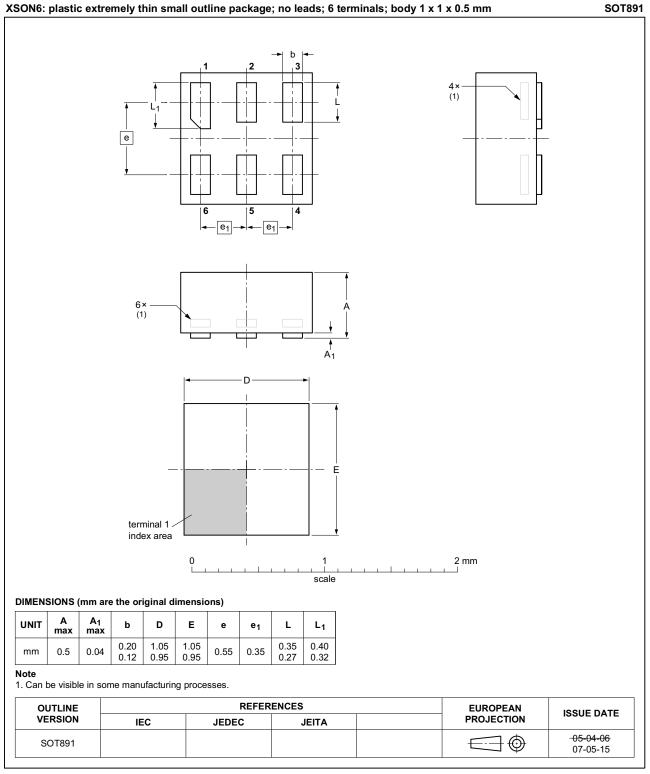
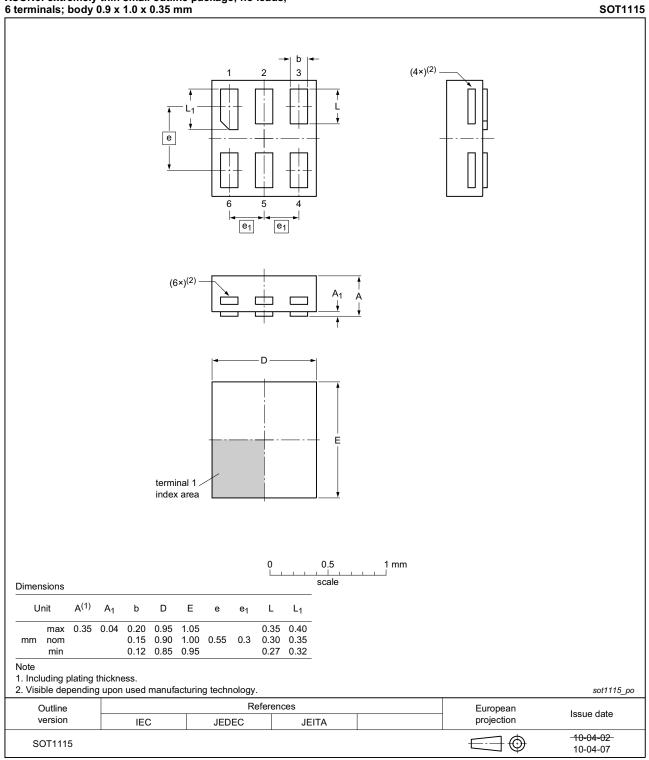


Fig 22. Package outline SOT891 (XSON6)

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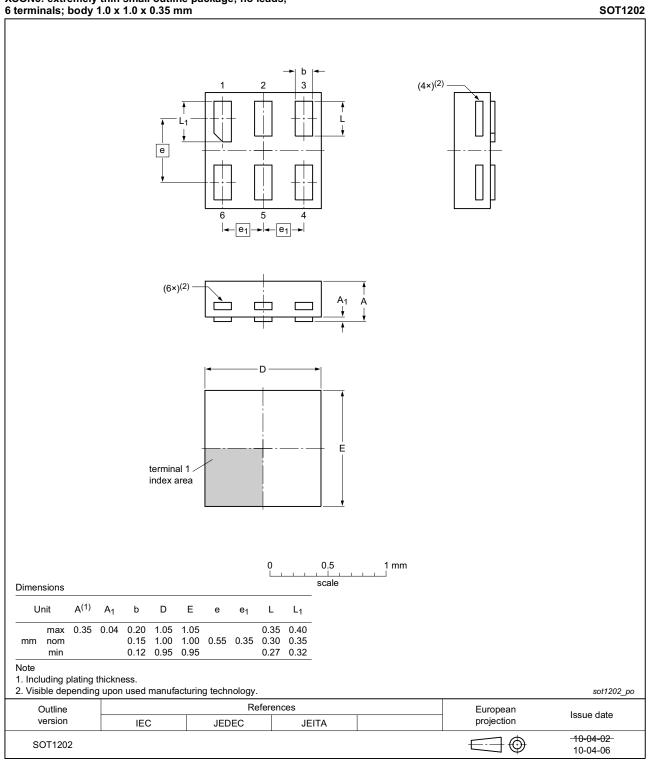


## XSON6: extremely thin small outline package; no leads; 6 terminals; body 0.9 x 1.0 x 0.35 mm

Fig 23. Package outline SOT1115 (XSON6)

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## XSON6: extremely thin small outline package; no leads; 6 terminals; body 1.0 x 1.0 x 0.35 mm

Fig 24. Package outline SOT1202 (XSON6)

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## **16. Abbreviations**

Table 13. Abbreviations				
Acronym	Description			
CMOS	Complementary Metal Oxide Semiconductor			
TTL	Transistor-Transistor Logic			
НВМ	Human Body Model			
ESD	ElectroStatic Discharge			
MM	Machine Model			
DUT	Device Under Test			

## 17. Revision history

### Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G57 v.8	20161207	Product data sheet	-	74LVC1G57 v.7
Modifications:	• <u>Table 8</u> : The r	maximum limits for leakage cui	rrent and supply cur	rent have changed.
74LVC1G57 v.7	20140910	Product data sheet	-	74LVC1G57 v.6
Modifications:	<ul> <li>Package outli</li> </ul>	ne drawing of SOT886 ( <mark>Figure</mark>	21) modified.	·
74LVC1G57 v.6	20111206	Product data sheet	-	74LVC1G57 v.5
74LVC1G57 v.5	20110922	Product data sheet	-	74LVC1G57 v.4
74LVC1G57 v.4	20101015	Product data sheet	-	74LVC1G57 v.3
74LVC1G57 v.3	20070719	Product data sheet	-	74LVC1G57 v.2
74LVC1G57 v.2	20060911	Product data sheet	-	74LVC1G57 v.1
74LVC1G57 v.1	20040906	Product data sheet	-	-

#### Low-power configurable multiple function gate

## **18. Legal information**

### 18.1 Data sheet status

Document status[1][2]	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

### 18.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any

representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

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